

Applicant : Zihong Jin et al.
Serial No. : 09/787,858
Filed : March 22, 2001
For : Performance Enhancing Additives for Electrochemical Cells

Art Unit: 1745
Examiner: Tracy Mae Dove

REMARKS

The specification has been amended to add an Abstract. Claim 14 has been amended. Claims 1-23 remain in the application. Reconsideration and reexamination of the application, as amended, are respectfully requested.

An Abstract has been added as a separate page following the claims. This Abstract is identical to the Abstract contained in International Patent Application No. PCT/US00/17561, which was the basis for the above-identified application, which was filed under 35 USC §371.

Claim 1 has been amended to recite that the n-type metal oxide additive is in the form of particles. This will be understood from the specification as a whole, in which the n-type metal oxide is disclosed as being in the form of a powder (e.g., page 11, lines 7-8, and Examples 1-6), the average particle size of which is disclosed (page 17, lines 10-15).

Claim 14 has been amended to delete the term "about." Claims 14-17 have been voluntarily amended, not in response to a rejection by the Examiner, to change "microns" to -- μm --.

In the Office action mailed on March 21, 2003, the Examiner objected to the application for not complying with the requirements of 37 CFR §1.72(b) and to claim 14 as being confusing. The Examiner also rejected claims 1-23. Claims 1-3, 5-8 and 10-12 were rejected under 35 USC §102(b) as being anticipated by Swierbut et al. (European Patent Publication No. EP 0747982 A1). Claims 1-23 were rejected under 35 USC §102(e) as being anticipated by Mansuetto (U.S. Patent No. 6,524,750). Claims 1-3, 5-7 and 10-12 were rejected under 35 USC § 102(e) as being anticipated by Hilarius et al. The objections to the application and claim 14 and the rejection of claims 1-3, 5-7 and 10-12 as being anticipated by Hilarius et al. have been overcome by the above amendments. Applicants disagree with the rejection of claims 1-3, 5-8 and 10-12 under 35 USC §102(b) as being anticipated by Swierbut et al. for the reasons below. The rejection of claims 1-23 under 35 USC §102(e) as anticipated by Mansuetto is traversed below.

Amended claim 1 recites an alkaline electrochemical battery cell comprising an anode, a cathode, a separator between the anode and cathode, and an electrolyte, wherein at least one of the anode, cathode and electrolyte contains metal oxide particles as an additive.

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Claims 1-3, 5-7 and 10-12 were rejected as anticipated by Hilarius et al., in which a cell to which inorganic particles, having coatings consisting of a metal oxide selected from the group consisting of Fe_2O_3 , NiO , CoO , ZrO_2 , SnO_2 , TiO_2 , Sb_2O_3 , PbO , Pb_3O_4 , Bi_2O_3 and mixtures thereof to increase cell discharge capacity, is disclosed. The single coatings consisting per se of one substance may be doped with foreign ions, such as SnO_2 coatings doped with foreign ions (e.g., antimony).

Claim 1 has been amended to clarify that the n-type metal oxide additive is in particulate form. In contrast, Hilarius et al. disclose the use of inorganic particles that are either plain (uncoated) or coated with single or multiple coatings. The n-type metal oxide additive of the present invention is not coated on a support particle, but is present in particulate form, so claims 1-3, 5-7 and 10-12 are novel over the disclosure of Hilarius et al.

Amended claim 1 is also nonobvious over Hilarius et al. This reference teaches that the cell capacity can be increased by using particles whose surface coatings are doped with foreign ions (e.g., SnO_2 coatings doped with antimony) but contains no suggestion that using particulate n-type metal oxide in order to increase discharge capacity at high current drains. The additive disclosed by Hilarius et al. also requires support particles, leaving less space for active materials, while the present invention avoids the need for support particles.

Claims 1-23 were rejected under 35 USC §102(e) as anticipated by Mansuetto. The 35 USC §102(e) date of the Mansuetto patent is June 17, 2000. Under 35 USC §102(e):

“a person shall be entitled to a patent unless the patent was described in – (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent...”

The §102(e) date of the Mansuetto patent is not prior to the invention of the subject matter of claims 1-23 of the present application, so claims 1-23 are not anticipated by Mansuetto under 35 USC §102(e).

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The USPTO determined that International Application No. PCT/US00/17561, filed on June 21, 2000, met the requirements of 35 USC §371 and was accepted for national patentability examination. As shown on FORM PCT/DO/EO/903 in the present application, the priority date is June 23, 1999, and the priority document has been received by the USPTO. The priority date is based on the priority claim in the International Application to US Patent Application No. 60/140590; a courtesy copy of the Request is being submitted herewith. While this priority application cannot be used to antedate a 35 USC §102(e) rejection, this priority application shows that the invention of the subject matter of claims 1-13 in the present application was prior to the §102(e) date of the Mansuetto patent. In the 60/140,590 application, which names Zhihong Jin and John H. Kennedy as inventors, claim 1 recites:

“An electrochemical battery cell comprising an anode, a cathode, a separator between the anode and cathode, and an electrolyte, wherein at least one of the anode, cathode, separator and electrolyte contains an n-type metal oxide additive.”

Claim 1 of the priority application contains all of the features of claim 1 of the present application, showing that the subject matter of claim 1 of the present application was invented by Jin and Kennedy prior to the §102(e) date of the Mansuetto patent. Additionally, the subject matter of each of claims 2, 3, 5, 6, 7, 8, 9, 10, 11, 12 and 13 of the present application is also contained in claims 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12, respectively. The subject matter of claim 4 of the present application is disclosed in the first paragraph of the Detailed Description of the Invention, Example 1 and Figs. 1-3 of the priority application. Claims 14-19 contain all of the limitations of claim 1. Therefore, claims 1-19 are not anticipated by Mansuetto under 35 USC §102(e).

Claim 20 of the present application recites an alkaline electrochemical battery cell in which at least one of the anode, cathode and electrolyte contains a niobium-doped TiO₂ additive having a resistivity less than 100 ohm-cm. Submitted herewith is a declaration by Michael F. Mansuetto, one of the inventors named in the present application, showing that a niobium-doped TiO₂ having a resistivity less than 100 ohm-cm was invented prior to the 35 USC §102(e) date of the Mansuetto patent. Claims 21-23 of the present application contain all of the limitations of claim 20. Therefore, claims 20-23 are not anticipated by Mansuetto under 35 USC §102(e).

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Claims 1-3, 5-8 and 10-12 were rejected as obvious over Swierbut et al. This reference discloses an alkaline cell with a zinc anode, a manganese dioxide cathode and an additive. The additive may be $\text{Fe}_2\text{O}_3\text{-TiO}_2$; a preferred additive is SnO_2 but may include Nb_2O_5 , WO_3 or both as well.

The additive recited in claim 1 is an n-type metal oxide and therefore different from $\text{Fe}_2\text{O}_3\text{-TiO}_2$, SnO_2 , Nb_2O_5 and WO_3 . SnO_2 and Nb_2O_5 are both white, and WO_3 is yellow or yellow-orange (CRC Handbook of Chemistry and Physics), indicating high resistivities. As declared by Michael F. Mansuetto in the 37 CFR §1.131 declaration being submitted herewith, the resistivity of a sample of commercially available $\text{Fe}_2\text{O}_3\text{-TiO}_2$ was measured at about 1.24×10^5 ohm-cm. An n-type material has a low resistivity. On page 4, lines 4-7, of the present application, a characteristic of an n-type semiconductor is a conductivity at room temperature ranging between 10^{-6} and 10^4 (ohm-m) $^{-1}$, which is equivalent to a room temperature resistivity range of 10^4 to 10^{-6} ohm-cm. Therefore, SnO_2 , Nb_2O_5 , WO_3 and $\text{Fe}_2\text{O}_3\text{-TiO}_2$ are not n-type materials.

The additive recited in claim 10 is also different from those disclosed by Swierbut et al. While Swierbut et al. disclose that SnO_2 along with one or both of Nb_2O_5 may be used as an additive, such a combination is quite different from SnO_2 doped with Nb_2O_5 or WO_3 . When SnO_2 is doped with Nb_2O_5 or WO_3 , niobium or tungsten cations, respectively, are inserted into the lattice structure of the SnO_2 , as disclosed in the first full paragraph of the present application.

For the above reasons, Swierbut et al. do not disclose the use of n-type materials as additives for alkaline zinc/manganese dioxide cells, so neither claim 1 nor claim 10 is anticipated by Swierbut et al.

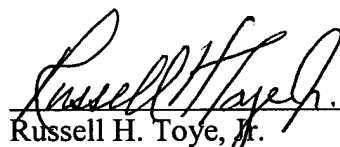
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The objections to the application and claim 14 have been overcome by the above amendments, and the rejections of claims 1-23 under 35 USC §102(b) and §102(e) have been traversed for the reasons above. It is believed that the application, as amended, is in condition for allowance. Withdrawal of the rejections under 35 USC §102(b) and §102(e) and allowance of claims 1-23 as amended are requested.

Respectfully submitted,

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